

WHAT IS CLAIMED IS:

1. An electrically-bent endoscope, comprising:
a motor for generating driving force;
a gear train for transmitting driving force generated by the motor;
a converting member for converting the driving force of the motor to a back and forth movement of a bending operation member for bending a bending portion at the head side of an inserting portion; and
a clutch mechanism having a transmitting member for connecting and disconnecting the gear train and the converting member, a thrust mechanism for moving the transmitting member in the axial direction of the converting member and a clutch operating member, connected to the thrust mechanism, for inputting instructions for connecting and disconnecting between the gear train and the converting member, the clutch mechanism connecting and disconnecting the driving force transmitted from the gear train to the converting member.
2. An electrically-bent endoscope according to Claim 1, wherein the clutch mechanism is provided at the final level of the gear train and connects and disconnects driving force transmitted from the gear train final level to the

converting member.

3. An electrically-bent endoscope according to Claim 1, wherein the final level of the gear train and the transmitting member are provided coaxially.

4. An electrically-bent endoscope according to Claim 1, wherein the motor, the gear train, the converting member and the clutch mechanism are provided in a gearbox.

5. An electrically-bent endoscope according to Claim 1, wherein a pinion engaging with the gear train is press-fitted into a motor axis of the motor.

6. An electrically-bent endoscope according to Claim 1, further comprising a first detector for detecting a rotating position of the converting member.

7. An electrically-bent endoscope according to Claim 3, wherein the thrust mechanism has a cam mechanism including a cam pin provided at a shaft to be rotated in response to a manipulation on the clutch operating member, a cam, provided in the transmitting member, having a cam slot for fitting the cam pin, and a guide member for preventing the rotation of the cam.

8. An electrically-bent endoscope according to Claim 4, wherein the gearbox is coated with a heat transmitting agent on the side facing toward the motor and also functions as a heat sink.

9. An electrically-bent endoscope according to Claim 6, further comprising:

a second detector for detecting a rotating position of the motor axis, a comparison unit for comparing information from the first detector and information from the second detector in order to detect the bending limit of the bending portion, and a warning unit for warning an operator based on the comparison result by the comparison unit.

10. An electrically-bent endoscope according to Claim 6,

wherein a gear engaging with the sprocket contains aluminum in the first detector.

11. An electrically-bent endoscope according to Claim 6,

wherein the clutch mechanism is detachable from the gearbox.

12. An electrically-bent endoscope according to Claim 7,

wherein the transmitting member has driving force transmitting pins for moving in the longitudinal axis direction of the shaft in response to the operation of the cam mechanism and being inserted to holes in the final level of the gear train and the converting member such that driving force transmitted from the final level of the gear train to the converting member can be connected and be disconnected.

13. An electrically-bent endoscope according to Claim 9, further comprising a control portion for terminating the motor when the comparison unit detects that the bending portion reaches the bending limit.

14. An electrically-bent endoscope according to Claim 9,

wherein the motor and the second detector are detachable from the gearbox.

15. An electrically-bent endoscope according to Claim 10,

wherein the gearbox covers the gear train.

16. An electrically-bent endoscope according to Claim 12,

wherein the guide member of the clutch mechanism also functions as a positioning flange for preventing the rotation of the cam in the transmitting member.

17. An electrically-bent endoscope according to Claim 14,

wherein the clutch mechanism is detachable from the gearbox.

18. An electrically-bent endoscope according to Claim 16,

wherein the clutch mechanism is detachable from the gearbox.

19. An electrically-bent endoscope, comprising:
a motor for generating driving force for bending a bending portion at the head portion of an inserting portion;
a gear train for transmitting driving force generated in the motor;

a sprocket for converting driving force of the motor to a back and forth movement of a bending operation wires; and

a clutch mechanism having a transmitting member for connecting and disconnecting the final level of the gear

train and sprocket, which are provided coaxially, a thrust mechanism for moving the transmitting member in the axial direction of the sprocket and a clutch operation knob, connected to the thrust mechanism, for inputting instructions for connecting and disconnecting the final level of the gear train and the sprocket.

20. An electrically-bent endoscope according to Claim 17,

wherein the thrust mechanism is a cam mechanism including a cam pin provided at a shaft rotating in response to a manipulation on the clutch operation knob, a cam having, in the transmitting member, a cam slot to which the cam pin freely fits, and a slide guide for preventing the rotation of the cam,

wherein the transmitting member moves back and forth in the longitudinal axis direction of the shaft in response to an operation of the cam mechanism and has one or more driving force transmitting pins for removably connecting and disconnecting the final level of the gear train and the sprocket,

wherein the final level of the gear train has one or more through portions through which the driving force transmitting pins of the transmitting member are inserted,

wherein the sprocket has one or more hole portions to

which the driving force transmitting pins through the final level of the gear train fit.

21. An electrically-bent endoscope, comprising:

a motor for generating driving force;

a driving force transmitting portion for transmitting driving force generated in the motor;

a converting portion for converting driving force of the motor to a back and forth movement of a bending operation member for bending a bending portion at the head of an inserting portion;

a clutch portion including a transmitting member for connecting and disconnecting the driving force transmitting portion and the converting portion, a thrust portion for moving the transmitting member in the axis direction of the converting portion, and an operating portion, connected to the thrust portion, for inputting instructions for connecting and disconnecting the driving force transmitting portion and the converting portion, the clutch portion connecting and disconnecting driving force transmitted from the driving force transmitting portion to the converting portion.

22. An electrically-bent endoscope, comprising:

a motor;

driving force transmitting means for transmitting driving force generated in the motor;

converting means for converting driving force of the motor to a back and force movement of a bending operation member for bending a bending portion at the head of an inserting portion;

clutch means including a transmitting member for connecting and disconnecting the driving force transmitting means and the converting means, means for moving the transmitting member in the axis direction of the converting means, and operating means, connected to the means, for inputting instructions for connecting and disconnecting the driving force transmitting means and the converting means, the clutch means connecting and disconnecting driving force transmitted from the driving force transmitting means to the converting means.